

AMENDMENT TO THE CLAIMS

1. (Currently Amended) A method for laser cooling of atoms ~~for laser cooling atoms~~ each involving a plurality of magnetic ~~subsidiary levels~~ sublevels as its cooling lower level being in a ground state in energy level, comprising:

emitting sequentially ~~each~~ coherent light of a predetermined wavelength containing a plurality of ~~different~~ differently polarized ~~light~~ lights to the atoms in response to the plurality of magnetic ~~subsidiary levels~~ sublevels being the cooling lower level in the ground state in an atom, which is an object to be laser-cooled, while keeping a predetermined time interval.

2. (Currently Amended) A method for laser cooling of atoms as claimed in claim 1 wherein said predetermined time interval is ~~that~~ substantially ~~twice~~ two times longer than a spontaneous emission lifetime of the atom corresponding to a time required for absorption - emission of one photon.

3. (Currently Amended) An apparatus for laser cooling of atoms ~~for laser cooling atoms~~ each involving a plurality of magnetic ~~subsidiary levels~~ sublevels as its cooling lower level being in a ground state in energy level, comprising:

a coherent light source for producing a coherent light having a predetermined wavelength; and

a polarized light control means for controlling polarized light of the coherent light output from said coherent light source to emit ~~the~~ coherent light of different ~~polarized light~~ polarizations to the atom with a predetermined time interval; and

wherein the polarized light of the coherent light emitted from said polarized light control means corresponds respectively to the plurality of ~~different~~ differently polarized ~~light~~ lights in response to the plurality of magnetic ~~subsidiary levels~~ sublevels being the cooling lower level in the ground state of an atom, which is an object to be laser-cooled.

4. (Currently Amended) An apparatus for laser cooling ~~of~~ atoms ~~for laser cooling atoms~~ each involving a plurality of magnetic ~~subsidiary levels~~ sublevels as its cooling lower level being in a ground state in energy level, comprising:

a plurality of coherent light sources outputting respectively a coherent light of a predetermined wavelength involving respectively a plurality of ~~different~~ differently polarized ~~light~~ lights in response to the plurality of magnetic ~~subsidiary levels~~ sublevels being the cooling level in the ground state of an atom, which is an object to be cooled; and

each coherent light ~~of the~~ having a predetermined wavelength and containing ~~the~~ a plurality of ~~different~~ differently polarized ~~light~~ lights output from said plurality of coherent light sources being sequentially emitted to the atom while keeping a predetermined time interval; and

wherein the polarized ~~light~~ and of the coherent light emitted from said plurality of coherent light sources ~~corresponding~~ corresponds respectively to the plurality of ~~different~~ differently polarized ~~light~~ lights in response to the plurality of magnetic ~~subsidiary-levels~~ sublevels being the cooling lower level in the ground state of the atom, which is the object to be laser-cooled.

5. (Currently Amended) An apparatus for laser cooling of atoms as claimed in claim 4 wherein:

at least one of said plurality of coherent light sources ~~is~~ that outputs selectively coherent light ~~involving~~ involves two ~~different~~ differently polarized ~~light~~ lights.

6. (Currently Amended) An apparatus for laser cooling of atoms as claimed in claim 3 wherein:

said predetermined time interval is ~~that~~ substantially ~~twice~~ two times longer than a spontaneous emission lifetime of the atom corresponding to a time required for absorption - emission of one

photon.

7. (Currently Amended) An apparatus for laser cooling of atoms as claimed in claim 4 wherein:

said predetermined time interval is ~~that~~ substantially ~~twice~~ two times longer than a spontaneous emission lifetime of the atom corresponding to a time required for absorption - emission of one photon.

8. (Currently Amended) An apparatus for laser cooling of atoms as claimed in claim 5 wherein:

said predetermined time interval is ~~that~~ substantially ~~twice~~ two times longer than a spontaneous emission lifetime of the atom corresponding to a time required for absorption - emission of one photon.

9. (Canceled)

10. (Currently Amended) An apparatus for laser cooling of atoms ~~for laser cooling atoms~~ each involving a plurality of magnetic ~~subsidiary levels~~ sublevels as its cooling lower level being in a ground state in energy level, comprising:

a coherent light source producing coherent light of

predetermined wavelength;

a polarized light control means including a half-wavelength plate and an acousto-optic device, and controlling polarized light obtained from the coherent light output from said coherent light source by means of said half-wavelength plate to emit coherent light involving different polarized light to the atoms with a predetermined time interval; and

chirped cooling being effected by changing time-varyingly a frequency by the use of said acousto-optic device to decelerate the atoms as well as to separate time-varyingly the polarized light obtained by means of said half-wavelength plate with the use of said acousto-optic device, ~~besides~~ in addition to ~~optimize~~ optimizing the frequency, thereby cooling the atoms by means of a scattering force.

11. (Canceled)

12. (Currently Amended) An apparatus for laser cooling of atoms ~~for laser cooling atoms~~ each involving a plurality of magnetic ~~subsidiary levels~~ sublevels as its cooling lower level being in a ground state in energy level, comprising:

a coherent light source including a first laser beam producing system for producing a laser beam of a first wavelength, and a

second laser beam producing system for producing a laser beam of a second wavelength as well as for ~~introducing~~ receiving said laser beam of the first wavelength produced in said first laser beam producing system ~~thereinto~~ to produce a laser beam of a third wavelength as a result of a sum frequency mixing of the laser beam of said first wavelength and the laser beam of said second wavelength;

a polarized light control means including a half-wavelength plate and an acousto-optic device, and controlling polarized light obtained from the coherent light output from said coherent light source by means of said half-wavelength plate to emit coherent light involving different polarized light to the atoms with a predetermined time interval; and

chirped cooling being effected by changing time-varyingly a frequency by the use of said acousto-optic device to decelerate the atoms as well as to separate time-varyingly the polarized light obtained by means of said half-wavelength plate with the use of said acousto-optic device, ~~besides~~ in addition to ~~optimize~~ optimizing the frequency, thereby cooling the atoms by means of a scattering force.